Applicants additionally request that all pertinent U.S. Patent and Trademark Office records relating to the subject application be changed to reflect the correction and that a corrected Notice of Allowance and Issue Fee Due transmittal be issued for use when paying the issue fee.

Dated: August 17, 2006

Respectfully submitted,

By_____

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Inventor: Chandra Mouli **Atty Docket No.:** M4065.0933/P933

Application No.: 10/612,194-Conf. #4126 **Filing Date:** July 3, 2003
Title: IMAGE SENSOR HAVING A TRANSISTOR FOR ALLOWING INCREASED DYNAMIC RANGE (as amended)

Documents Filed:
Amendment (14 pages)

Amendment Transmittal (1 page)

Via: Daily PTO Run
Sender's Initials: TJD/EP/kl

Date: February 9, 2005

AMENDMENT TRANSMITTAL LETTER

Docket No. M4065.0933/P933

Application No.	Filing Date	Examiner	Art Unit
10/612,194-Conf. #4126	July 3, 2003	T. N. Tran	2826

Applicant(s): Chandra Mouli

Invention: IMAGE SENSOR HAVING A TRANSISTOR FOR ALLOWING INCREASED DYNAMIC RANGE (as amended)

TO THE COMMISSIONER FOR PATENTS

Transmitted herewith is an amendment in the above-identified application.

The fee has been calculated and is transmitted as shown below.

CLAIMS AS AMENDED					
	Claims Remaining After Amendment	Highest Number Previously Paid	Number Extra Claims Present	Rate	
Total Claims	39	- 59 =		x	
Independent Claims	5	- 8 =		x	
Multiple Dependent Claims (check if applicable)	☐				
Other fee (please specify):					
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT:					0.00

☒ Large Entity ☐ Small Entity

☒ No additional fee is required for this amendment.

☐ Please charge Deposit Account No. _____ in the amount of $ _____.
A duplicate copy of this sheet is enclosed.

☐ A check in the amount of $ _____ to cover the filing fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☒ The Director is hereby authorized to charge and credit Deposit Account No. 04-1073 as described below. A duplicate copy of this sheet is enclosed.

☒ Credit any overpayment.

☒ Charge any additional filing or application processing fees required under 37 CFR 1.16 and 1.17.

Dated: February 9, 2005

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Docket No.: M4065.0933/P933
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Chandra Mouli

Application No.: 10/612,194 | Confirmation No.: 4126

Filed: July 3, 2003 | Art Unit: 2826

For: IMAGE SENSOR HAVING A TRANSISTOR FOR ALLOWING INCREASED DYNAMIC RANGE (as amended) | Examiner: T. N. Tran

AMENDMENT IN RESPONSE TO NON-FINAL OFFICE ACTION

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

INTRODUCTORY COMMENTS

In response to the Office Action dated November 22, 2004 (Paper No. Mail Date 20041001), please amend the above-identified U.S. patent application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks begin on page 14 of this paper.

AMENDMENTS TO THE SPECIFICATION

Page 1, please amend the title as follows:

IMAGE SENSOR ~~WITH IMPROVED~~ HAVING A TRANSISTOR FOR ALLOWING INCREASED DYNAMIC RANGE ~~AND METHOD OF FORMATION~~

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions or listings of claims for this application.

Listing of Claims:

1. (Currently amended) A pixel cell comprising:

   at least one transistor structure comprising:

   at least one semiconductor channel region;

   at least one gate for controlling the channel region; and

   first and second leads respectively coupled to a source region on one side of the at least one channel region and a drain region on an opposite side of the at least one channel region, wherein the at least one transistor structure has at least two threshold voltages associated with the at least one channel region, and wherein an [[I-V]]current-voltage characteristic of the transistor structure is determined at least in part by the threshold voltages.

2. (Original) The pixel cell of claim 1, wherein the at least one transistor structure is an active element for operating at least in part in a sub-threshold region.

3. (Original) The pixel cell of claim 1, wherein the at least one transistor structure is a source follower transistor structure.

4. (Original) The pixel cell of claim 1, wherein the at least one transistor structure comprises first, second, and third channel regions connected in parallel.

5. (Currently amended) The pixel cell of claim 4, wherein the first channel region corresponds to a ~~highest~~ first threshold voltage and the second and third channel regions correspond to second and third threshold voltages, respectively, and wherein the first threshold voltage is higher than the second and third threshold voltages.

6. (Currently amended) The pixel cell of claim 4, wherein a first channel region corresponds to a ~~highest~~ first threshold voltage and second and third channel regions correspond to a second threshold voltage, and wherein the first threshold voltage is higher than the second threshold voltage.

7. (Original) The pixel cell of claim 1, wherein the at least one transistor structure comprises one channel region, and wherein the channel region comprises a normal conduction path and at least one parasitic conduction path.

8. (Original) The pixel cell of claim 7, wherein the normal conduction path is associated with a highest first threshold voltage and the at least one parasitic conduction path is associated with at least a second lower threshold voltage.

9. (Original) The pixel cell of claim 8, wherein the transistor structure comprises first and second parasitic conduction paths, and wherein the first and second parasitic conduction paths are associated with a second threshold voltage.

10. (Original) The pixel cell of claim 8, wherein the transistor structure comprises first and second parasitic conduction paths, and wherein the first and second parasitic conduction paths are associated with second and third threshold voltages, respectively.

11. (Original) The pixel cell of claim 1, wherein the two or more threshold voltages result at least in part from the at least one transistor structure having any of: two or more gate oxide thicknesses, two or more channel dopant concentrations, and two or more gate work-functions.

12. (Currently amended) The pixel cell of claim 1, wherein the [[I-V]]current-voltage characteristic is such that a sub-threshold region and a linear region provide a same or similar amplification factor for a signal.

13. (Original) The pixel cell of claim 1, further comprising a photo-conversion device.

14. (Original) The pixel cell of claim 13, wherein the photo-conversion device is a pinned photodiode.

15. (Withdrawn) A pixel cell comprising:

a photo-conversion device; and

at least one transistor structure comprising:

first, second, and third semiconductor channel regions;

at least one gate for controlling the channel regions; and

first and second leads respectively coupled to source regions on one side of the channel regions and drain regions on an opposite side of the channel regions, wherein the first channel region is associated with a highest first threshold voltage, and wherein the second and third channel regions are associated with at least a second threshold voltage, and wherein an I-V characteristic of the transistor structure is determined at least in part by the threshold voltages.

16. (Withdrawn) The pixel cell of claim 15, wherein the at least one transistor structure is an active element for operating at least in part in a sub-threshold region.

17. (Withdrawn) The pixel cell of claim 15, wherein the at least one transistor structure is a source follower transistor structure.

18. (Withdrawn) The pixel cell of claim 15, wherein the second and third channel regions are associated with second and third threshold voltages, respectively.

19. (Withdrawn) The pixel cell of claim 15, wherein the two or more threshold voltages result at least in part from the at least one transistor structure having any of: two or more gate oxide thicknesses, two or more channel dopant concentrations, and two or more gate work-functions.

20. (Currently amended) A pixel cell comprising:

a photo-conversion device; and

at least one transistor structure comprising:

a channel region;

a gate for controlling the channel region; and

first and second leads respectively coupled to a source region on one side of the channel region and a drain region on an opposite side of the channel region, wherein the channel region comprises a normal conduction path and at least one parasitic conduction path, and wherein the normal conduction path is associated with a highest first threshold voltage, and wherein the at least one parasitic conduction path is associated with at least a second threshold voltage, and wherein an [[I-V]]current-voltage characteristic of the transistor structure is determined at least in part by the threshold voltages.

21. (Original) The pixel cell of claim 20, wherein the at least one transistor structure is an active element for operating at least in part in a sub-threshold region.

22. (Original) The pixel cell of claim 20, wherein the at least one transistor structure is a source follower transistor structure.

23. (Original) The pixel cell of claim 20, wherein the channel region comprises first and second parasitic conduction paths, and wherein the first and second parasitic conduction paths are associated with second and third threshold voltages, respectively.

24. (Original) The pixel cell of claim 20, wherein the first and at least second threshold voltages result at least in part from the at least one transistor structure having any of: at least two gate oxide thicknesses and at least two channel dopant concentrations.

25. (Currently amended) An image sensor, comprising:

an array of pixel cells, wherein at least one of the pixel cells comprises:

a photo-conversion device; and

a transistor structure, the transistor structure comprising:

at least one semiconductor channel region;

at least one gate for controlling the channel region; and

first and second leads respectively coupled to a source region on one side of the at least one channel region and a drain region on an opposite side of the at least one channel region, wherein the transistor structure has at least two threshold voltages associated with the at least one channel region, and wherein an [[I-V]]current-voltage characteristic of the transistor structure is determined at least in part by the threshold voltages.

26. (Original) The image sensor of claim 25, wherein the transistor structure is an active element for operating at least in part in a sub-threshold region.

27. (Original) The image sensor of claim 25, wherein the transistor structure is a source follower transistor structure.

28. (Original) The image sensor of claim 25, wherein the transistor structure comprises first, second, and third channel regions connected in parallel.

29. (Currently amended) The image sensor of claim 28, wherein the first channel region corresponds to a ~~highest~~ first threshold voltage and the second and third channel regions correspond to second and third threshold voltages, respectively, and wherein the first threshold voltage is higher than the second and third threshold voltages.

30. (Currently amended) The image sensor of claim 28, wherein the first channel region corresponds to a ~~highest~~ first threshold voltage and the second and third channel regions correspond to a second threshold voltage, and wherein the first threshold voltage is higher than the second threshold voltage.

31. (Original) The image sensor of claim 25, wherein the transistor structure comprises one channel region, and wherein the channel region comprises a normal conduction path and at least one parasitic conduction path.

32. (Original) The image sensor of claim 31, wherein the normal conduction path is associated with a highest first threshold voltage and the at least one parasitic conduction path is associated with at least a second threshold voltage.

33. (Original) The image sensor of claim 32, wherein the transistor structure comprises first and second parasitic conduction paths, and wherein the first and second parasitic conduction paths are associated with a second threshold voltage.

34. (Original) The image sensor of claim 32, wherein the transistor structure comprises first and second parasitic conduction paths, and wherein the first and second parasitic

conduction paths are associated with second and third threshold voltages, respectively.

35. (Original) The image sensor of claim 25, wherein the two or more threshold voltages result at least in part from the transistor structure having one or more of: two or more gate oxide thicknesses, two or more channel dopant concentrations, and two or more gate work-functions.

36. (Currently amended) The image sensor of claim 25, wherein the [[I-V]]current-voltage characteristic is such that a sub-threshold region and a linear region provide a same or similar amplification factor for a signal.

37. (Original) The image sensor of claim 25, further comprising a photo-conversion device.

38. (Original) The image sensor of claim 37, wherein the photo-conversion device is a pinned photodiode.

39. (Currently amended) A processor system, comprising:

(i) a processor; and

(ii) an image sensor coupled to the processor, the image sensor comprising:

one or more pixel cells, the one or more pixel cells comprising:

a photo-conversion device and a transistor structure, the transistor structure comprising:

at least one semiconductor channel region;

at least one gate for controlling the channel region; and

first and second leads respectively coupled to a source region on one side of the at least one channel region and a drain region on an opposite side of the at least one channel region, wherein the transistor structure has at least two threshold voltages associated with the at least one channel region, and wherein an [[I-V]]current-voltage characteristic of the transistor structure is determined at least in part by the threshold voltages.

Claims 40-59 (Canceled).

60. (New) The system of claim 39, wherein the transistor structure is an active element for operating at least in part in a sub-threshold region.

61. (New) The system of claim 39, wherein the transistor structure comprises first, second, and third channel regions connected in parallel.

62. (New) The system of claim 39, wherein the first channel region corresponds to a first threshold voltage and the second and third channel regions correspond to second and third threshold voltages, respectively, and wherein the first, second and third threshold voltages are different from one another.

63. (New) The system of claim 28, wherein the first channel region corresponds to a first threshold voltage and the second and third channel regions correspond to a second threshold voltage, and wherein the first threshold voltage is different than the second threshold voltage.

REMARKS

The specification has been amended changing the title to more clearly indicate the nature of the invention. The amendment to the title is not intended to limit the scope of any of the claims herein.

Claims 1, 5, 6, 12, 20, 25, 29, 30, 36, and 39 have been amended. Claims 60-63 have been added. No new matter has been added. Claims 40-59 have been canceled without prejudice to the underlying subject matter. Claims 15-19 were previously withdrawn.

Claims 1-14 and 20-39 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner states that in claim 1, the text "an I-V characteristic" is unclear. Claim 1, and also claims 12, 20, 25, 36, and 39, have been amended to clearly refer to the current-voltage characteristic. Further, the Examiner states that in claims 5, 6, 29, and 30, "a highest first threshold voltage" is indefinite. Claims 5, 6, 29, and 30 have been amended to clarify the relationships between the threshold voltages defined in claims 5, 6, 29, and 30. In light of these amendments, withdrawal of this rejection is respectfully requested.

Claims 1-4, 7, 11-14, 25-28, 31, and 35-39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu et al., US Patent No. 5,912,836 ("Liu") in view of Fossum, US Patent No. 6,744,084; Publication No. US 2004/0043529 ("Fossum"). This rejection is respectfully traversed.

The Examiner relies on the combination of Liu and Fossum. However, the Examiner's use of Fossum is not permitted to preclude patentability under 35 U.S.C. § 103(a) as provided by 35 U.S.C. § 103(c). The subject matter of Fossum and the claimed invention were, at the time the invention was made, subject to an obligation of assignment to the same entity: Micron Technology, Inc. The assignment for the present application was recorded in the PTO on July, 3, 2003, at Reel 014254, Frame 0280. The assignment

for Fossum was recorded in the PTO on August 29, 2002, at Reel 013243 Frame 0789. Further, the Assignee appears on the face of the Fossum patent. Therefore, 35 U.S.C. § 103(c) applies. As a result, the Examiner's rejection of claims 1-14 and 20-39 based on Fossum cannot be sustained and withdrawal of this rejection is respectfully requested.

Applicant graciously acknowledges the Examiner's indication that claims 5, 6, 8-10, 29, 30, 32-34 contain allowable subject matter. As discussed above, however, Applicant believes that these claims depend from allowable base claims and, therefore, it is not necessary to rewrite these claims in independent form.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Dated: February 9, 2005

Respectfully submitted,

By_____

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